When a plant is rotated on an equally rotating horizontal clinostat, a convex curving always occurs regardless of the orientation of the plane of the blade with the axis; this is an epinastic movement. When the plane of the blade is vertical and the midrib horizontal, the leaf is said to be in a flank position; it is evident that there are two flank positions. If a leaf is left in a flank position, the petiole shows both a torsion and a convex bending which finally give the blade the normal horizontal position. By use of an intermittent clinostat which gives repeated 5–15 minute exposures in one flank position followed by equal exposures in the other, all torsion is avoided, but convex curving takes place. The successive flank exposures equalize the effect of gravity and allow epinasty to express itself. By use of the intermittent clinostat, equal exposures between -45° and the two flank positions were given. In this case concave bending occurred, showing that the geotropic stimulus entirely overcame the epinastic; this gives a means of determining the relative strength of the two stimuli. KNIEP puts the question, Can a leaf blade be so oriented on an equally rotating clinostat that concave bending will appear? This is easily accomplished by the use of the oblique clinostat and the combined angles that are possible on it. The great possibility of combinations of angles of geotropic exposure due to variation in obliquity of the clinostat axis and the obliquity of the organ axis with the clinostat axis has been emphasized by FITTING.

This work is the natural outcome of the improved methods that FITTING has given for dealing with problems in geotropism.—WILLIAM CROCKER.

Photosynthesis.—SCHRYVER[7] believes that he has thrown some light on the mechanism of carbon fixation in green plants. He first describes a modification of Rimini's test for formaldehyde. By the test as modified, 1 p.p.m. formaldehyde gave the reaction, and by proper modification, both free and combined formaldehyde can be detected. Rather accurate quantitative estimates can be made in concentrations varying from 1 part in 100,000 to 1 part in 1,000,000. Films of chlorophyll were formed on glass plates by evaporation of ether solutions. Such plates, exposed to light in the presence of moist CO_2, showed a marked formaldehyde test; those similarly exposed in absence of CO_2 showed a slight reaction, and those in darkness none. The formaldehyde in plates illuminated in absence of CO_2 was supposed to be formed from CO_2 produced by the chlorophyll film. He believes the formaldehyde formed makes a rather stable compound with chlorophyll, much as it does with amino-containing compounds. He considers the reaction reversible, and represents it as follows: $\text{Chloro}^{H}_{H}+HCHO \leftrightharpoons \text{Chloro}-CH_2+H_2O$. The removal of CH_2O in sugar formation will cause the reaction to move in the sense of the upper arrow, while accumulation of CH_2O will lead to the reaction moving in the sense of the lower arrow. These results agree with the

[7] SCHRYVER, S. B., Photochemical formation of formaldehyde in green plants. Proc. Roy. Soc. London B **82**: 226–232. 1910.

view expressed by EULER that the formaldehyde exists mainly in combination, and show why EWART was able to extract formaldehyde from chlorophyll.

BERTHELOT and GAUDECHON[8] have accomplished some most interesting syntheses and decompositions of chemical compounds by means of the mercury vapor lamp, ich in ultra-violet. All the results indicate the existence of balances in the reactions. Water was synthesized from H_2 and O_2 and decomposed into these elements. Mixtures of CO and O_2 exposed to the ultra-violet produced considerable CO_2. CO_2 thus exposed gave a slight amount of CO and O_2. If phosphorus were also present with the CO_2, a much greater yield of CO resulted, due to the removal of O_2 by phosphorus. If a mixture of CO_2 and H_2 were exposed to the light, considerable formaldehyde resulted. Mixtures of CO and H_2 thus exposed produced considerable formaldehyde. Formaldehyde was decomposed into CO, CO_2, H_2, and CH_4. These results certainly show great possibility in photosynthesis, as the authors use the term, meaning any synthesis by light.

The work suggests the possibility of chlorophyll functioning by transforming the long rays of the red and blue to short ultra-violet rays, which are more effective chemically. This conclusion, however, one should not accept too readily, for GIBSON, working with the leaf, and LÖB, with the effect of silent electrical discharges on solutions of carbonic acid, have shown the possibility of another conception, namely, that the leaf transforms the absorbed light to electricity, which accomplishes the reduction of the carbonic acid to formaldehyde and perhaps the condensation of the latter to sugars. Neither conception is by any means proved; either, however, explains the peculiar fact that red rays (generally ineffective chemically) are very effective in photosynthesis.—WILLIAM CROCKER.

Digestion of sugars.—The tendency to consider enzymes as specific in their activity, and the desire to distinguish enzymes already known and to discover new ones, have often distracted the attention from the more interesting problems in general physiology regarding enzymes. Such a problem is the relation between the enzymes produced by an organism and the utilization of the different substances on which it is able to nourish itself. From this point of view COLIN[9] makes a comprehensive study of the enzyme activities of the mold *Botrytis cinerea* in the group of sugars. The mold was cultivated on various polyoses, and a study made of the transformations in each case. The enzymes in the culture liquid and mycelium after growth on each sugar was then studied. This was followed by an investigation of the relation which exists between the polyose sugars in general and the enzymes produced by the mold. The mold grew well and showed little morphological variation on

[8] BERTHELOT et GAUDECHON, Compt. Rend. Acad. Sci. **150**: 1690–1693. 1910.

[9] COLIN, H., Hydrolyses de quelques polysaccharides par C *Botrytis cinerea*. Ann. Sci. Nat. Bot. **13**: 1–111. 1911.